

Enhancing Returns

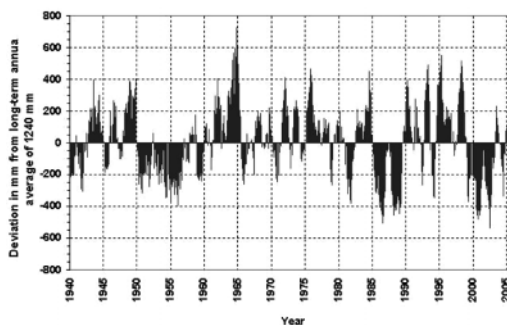
Cropping with conservation tillage and poultry litter in the Southeast

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Rainfall distribution is not always optimal for crop growth in the humid Southeast, which receives from 1118 to 1778 mm (44 to 70 in.) of mean annual precipitation. Short-term drought is common during critical crop growth periods and periodically, multi-year droughts occur. Drought across the Southeast from 1998 to 2002, one of the most severe in recent memory, caused much economic hardship for farmers across the region. Losses to drought for nine major crops for the 2000 cropping season alone in Georgia were estimated to be 39 percent of normal crop production with the losses valued at \$689 million. Irrigation is an option for reducing yield loss risks from drought, however, irrigation infrastructure costs, as well as increasing competition among socioeconomic sectors for water, hinder widespread implementation. Adoption of conservation tillage has great potential to enhance agricultural economic returns and conserve regional water resources in a cost-effective manner. Unlike irrigation, conservation tillage is feasible in most situations, requires little or no capital investment, and is not constrained by competing socio-economic interests.

Suited to the soil

Many soils of the Southeast have low water-holding capacity and are prone to crusting and/or formation of hard pans, which exacerbate drought problems. Conventional tillage, such as moldboard plowing, chisel plow-



Twelve months moving average rainfall for Watkinsville, Ga. Note the common occurrence of sometimes sustained below normal rainfall, such as in the 1950s, late 1980s, and recently from 1998 to 2002.

ing, and disking, destroys organic matter, adversely affecting soil properties critical for water infiltration. Use of conservation tillage with cover crops causes minimal soil surface disturbance and builds soil organic matter, which helps soil to aggregate and increase biological activity. The net effect, usually, is increased infiltration, reduced evaporation, and improved water and nutrient availability. About 48 percent of the 2.7 million ha (6.7 million acres) of corn and about 22 percent of the almost 4.9 million ha (12 mil-

lion acres) of cotton in the South were planted in conservation tillage in 2004. The adoption rate in cotton has grown to nearly 50 percent in Georgia, South Carolina, Alabama, Florida, and North Carolina on the 2.9 million ha (7.2 million acres) planted in 2004.

In addition to conservation tillage, many producers in the South utilize poultry litter as a source of nutrients, primarily on pastures but also in row crops. About 10 million Mg (11 million tons) of litter is produced annually in the United States. With more than 50 percent of the poultry production concentrated in Alabama, Arkansas, Georgia,



A young rye cover crop flourishes at the study site.

and North Carolina, many Southern producers have a ready source of nutrients including N, P, and K.

Yields with poultry litter nothing to balk at

In research under rain-fed conditions from 1996 to 2000 at the USDA-ARS J. Phil Campbell Sr. Natural Resource Conservation Center, Watkinsville, Ga., it was found that growing cotton in no-till with poultry litter as fertilizer gave superior lint yields compared to cotton grown in conventional tillage fertilized with ammonium nitrate. During the first three years, water availability was below optimum but there were no serious deficits during blooming, which is a very critical period for cotton growth. Yields from no-till cotton fertilized with poultry litter were higher by 43, 35, and 50 percent, respectively, for each of the three years. In the fourth year, a 35-day period of virtually no rainfall occurred during blooming. As a result, this season's yield was least of the five years, and there was no yield difference between tillage and fertilizer treatments. In this year, despite no-till soil having greater capacity for soil water infiltration, the severe lack of rainfall limited the benefit of increased infiltration to store sufficient water for cotton use. In the fifth year, drought during establishment caused severe stress in the conventional tillage cotton, but the no-till cotton showed less stress and reached bloom stage in better condition. A mild drought during blooming exerted additional stress, which was more apparent on the conventional tillage cotton. As a result, yield from no-till cotton was more than 50 percent greater. Over the five growing seasons, no-till enhanced lint yield by 32 percent while fertilization with poultry litter enhanced yield an additional 10 percent. In another five-

year study, similar results were found for corn. Corn yield was enhanced 31 percent by combination of no-till and poultry litter compared to 11 percent with no-till and conventional fertilizer.

Saving dollars and the environment

A nutrient management plan is an essential tool in farm operations for the sake of sound economics and environmental stewardship. The nutrient content of poultry litter can vary depending on the type of poultry operation,

litter collection method, and length of storage of the litter. Over use of poultry litter as an N source can lead to excessive accumulation of P in soils, which is considered a potential environmental problem because of possible losses to water bodies. In this study, it was found that application of 4.5 Mg per ha (2 tons per acre) of poultry litter in cotton production did not increase soil P levels over five years. In the subsequent corn study,

soil P levels increased significantly because litter was over applied to levels of 11.25 to 22.5 Mg per ha (5-10 tons per acre) in order to investigate release of sex hormones from poultry litter.

The research has demonstrated that no-tillage has great potential to mitigate risks from droughts and increase cotton and corn yield in the Southeast, either with a common commercial nitrogen source or with poultry litter as a carefully managed fertilizer. An independent rainfall simulation study found that conservation tillage could potentially reduce irrigation needs by as much as 12 percent in Georgia. Unfortunately, no-till or other forms of conservation tillage have not been considered as part of the arsenal of tools used for regional and statewide water resource conservation planning in the South, and they should because of the economic and environmental advantages they offer. **R**

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Poultry litter is applied with a tractor-mounted precision applicator.



No-till maintains large residue amount between cotton rows in contrast to the bare soil in the conventional tillage.